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Bob Cooper's

SEPTEMBER 15 1996

SatFACTS

MONTHLY

Reporting on "The World" of satellite television in the Pacific Ocean Region

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EM TV: "We were forced to scramble"

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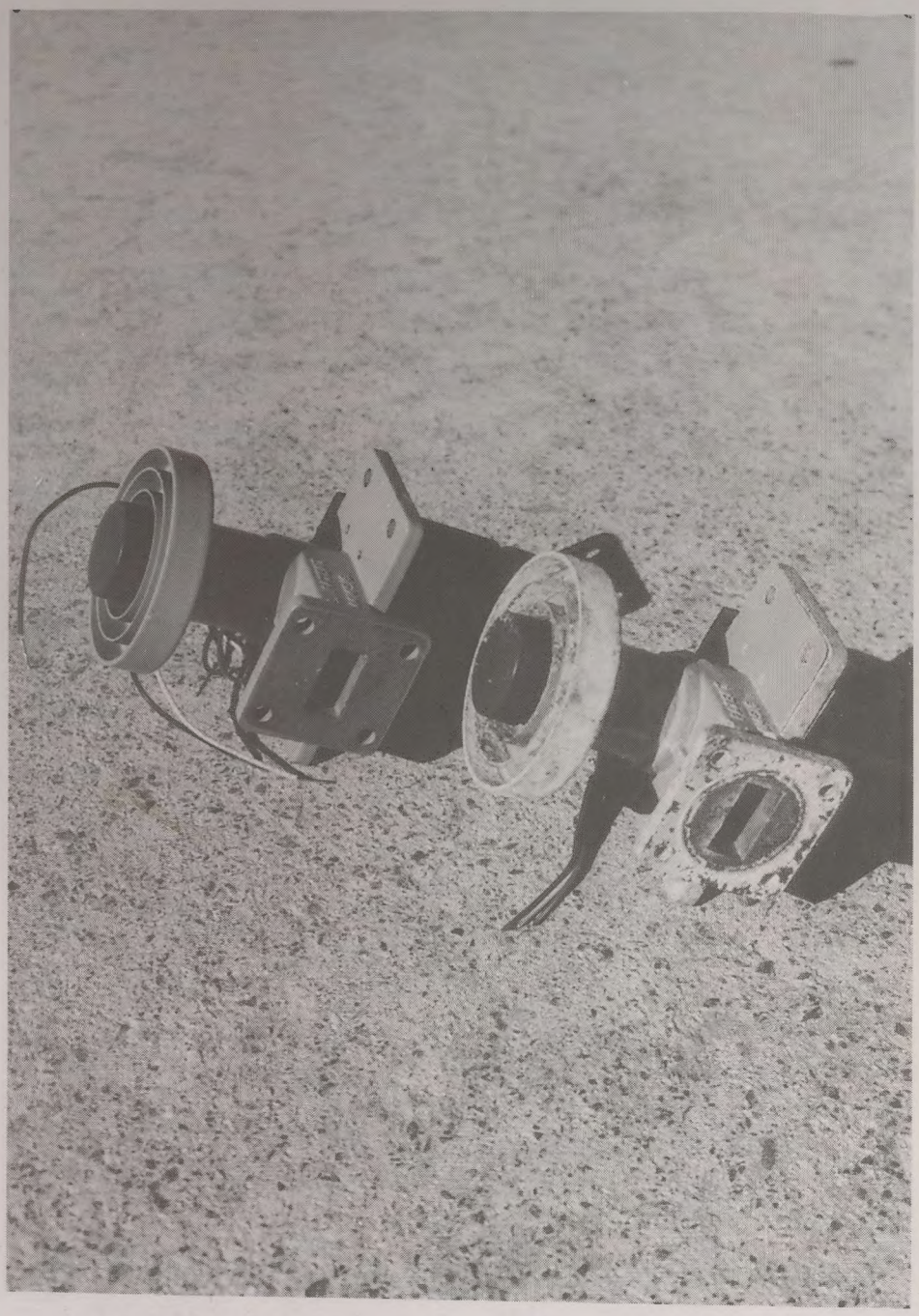

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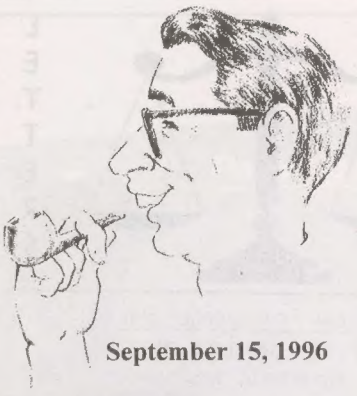
ERRATA

COOP'S COMMENT



September 15, 1996

Interest in private (home) dish systems for programming such as the European Bouquet (EB) is very high; sales, actual system sales, are slow. One must ponder why.

Price is certainly one stumbling block; with Panasat IRD520s consumer listed in the A$1,600 region the price of a complete system (dish, LNB, IRD, cabling, installation) mounts up quickly. I understand one installer in Australia is offering a 1.8m EB system, installed, for A$1,995.

I am reminded of a similar situation when the first microwave ovens appeared. A US company, Raytheon, had used World War Two contracts to create special expertise in the design and manufacture of microwave "magnetrons." The magnetron is a type of tube which generates microwave transmission energy. Historians believe the Allied development and use of microwave radar systems played a significant role in the defeat after 1943 of the Axis powers in Europe and the Pacific. In 1943 magnetrons were hand assembled and on average Raytheon, the world's largest supplier at the time, had a good week when it got 17 magnetrons constructed and through testing. Within a year Raytheon had created an entirely new technology and was producing 2,600 magnetrons daily. As a result radar sets became so common place within the military that even field troops used it to detect the forward motion of Axis armour.

In 1945 the war ended and Raytheon sat there with the technology to build thousands of magnetrons per day. But no orders because the military no longer required them in quantity. Some Raytheon engineers had been playing with a magnetron in a metal box to 'warm' their lunches. The Radarange Oven was the result and Raytheon tried switching from military to the consumer world. They stumbled and fell lacking that special consumer expertise required to turn a brilliant product into a household word.

After several million dollars spent on attempting to create a market, Raytheon stuffed the product onto a shelf. Fast forward to 1964. Raytheon, now certain it needed business beyond military electronics, purchases a company called Amana; a manufacturer of household appliances including refrigerators. Someone suggests that Amana's consumer oriented personnel take a look at the now nearly two decade old Radarange technology. In 1967 the Amana division of Raytheon sold 65,000 consumer Radaranges and the "microwave oven boom" was off and running.

Amana's George Foerstner knew how to move consumer products. His philosophy was as follows: "*The secret is obtaining and keeping distributors. You do this by appealing to their selfishness. A distributor has to be selfish. As a manufacturer, you have to make sure he makes enough money handling your products to abandon all competitive lines. Any other appeal is a waste of time.*" Foerstner also believed in advertising. He often said, "*Advertising is the engine of sales. Without it, sales inevitably drop off. And though half of all advertising money is wasted, nobody knows which half.*" DTH sales in the Pacific could use a now-generation George Foerstner.

In Volume 3 ◆ Number 25

-ON THE COVER-

15 Months in the air and shot to hell. This Chaparral Ku Wideband Polarotor (tm) "USA-made servo motor" had a short life: 10 months and then it froze. The balance of the feedhorn weathered to the point of badly degraded reception in 5 more months. Cover photo compares box-new and broken specimens.

LETTERS

Why Digital Transponder Back-offs?

Reference the lack of a real digital threshold improvement over same transponder operating in analogue (SF#23, p.8). If all analogue satellite links are frequency modulated, I cannot see how the average/peak power considerations can have any bearing on the arguments regarding digital v. analogue thresholds. Can you clarify?

Peter Ball, Raumati Beach, NZ

When a frequency modulated analogue signal is operated at full transponder amplification, a significant portion of the transponder sees only sideband energy from the FM signal and thus the peak (maximum) carrier level can reach one maximum while the sidebands some distance in frequency removed from the centre of the active transponder portion reach far lower levels. The average power is all of the power spread throughout the 27/30/36/38/54 MHz transponder and that average is 10-12 dB below the peak level for the centre frequency. Conversely, a digital signal occupies all of its assigned transponder width at a single level; average and maximum are the same.

Unfortunately, virtually every transponder now in use on any satellite we see here in the Pacific has been designed to peak power levels not average power levels. The next generation satellites (possibly the PAS-8 will be the first in our region) are being redesigned to allow higher average powers. For now, transponders designed for peak must be throttled back as much as 6 dB when passing high-average (i.e., digital) signals to avoid intermodulation (distortion products created by the transponder). Our MPEG levels are reduced by the satellite operator primarily to ensure the signal does not become distorted within the satellite itself.

-continues on page 4-

PROGRAMMER PROGRAMMING PROMOTION UPDATE

SEPTEMBER 15, 1996

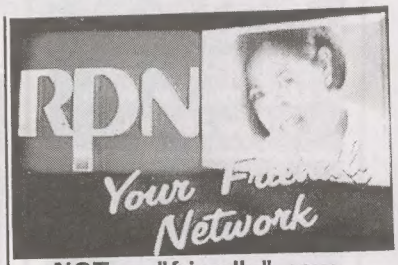
AFRTS hackers are on a short string with their B-MAC modified access to the American forces channel (I177E, 973IF, LHC). Scientific-Atlanta is constructing a six (TV) programme channel PowerVu MPEG service for AFRTS that will carry a full-time composite of news (CNN) and sports (ESPN); The Spectrum Channel composed of materials sourced from Discovery, Lifetime, A&E, PBS and some classic movies and mini-series; four time shifted entertainment channels directed at (the) Americas, Europe, (the) Pacific and Korea; plus six stereo and a pair of mono radio channels that will include country, jazz, classical, rock, adult contemporary and National Public Radio as well as news and sports. Now **that** is worth hacking!

ApStar 1A is indeed at 134E with a pattern that barely nudges into extreme northern Australia. Big-dish equipped Australian observers are urged to file reports with us; try 3885/IF1265 for openers. Six Chinese TV services have migrated to 1A from ChinaSat 5; programming that would have gone to new Hughes built 376 platform 24 transponder (C-band) ChinaSat 7. Alas, ChinaSat 7 like many recent Long March launches, lifted off at 10.27 UTC August 15 - and - failed to make orbit. Some of the most dangerous terrain in the world, these days, is "down range" from the Chinese Long March launch facility!

B2P, leased/sold/loaned/rented to Filipino Mabuhay group is at 144E with limited use and problems. Problem one is the presence of Rimsat/R42 at 142.5 which uses LHC polarisation; not good for B2P's linear polarised terminals throughout the SE Asia region. Mabuhay plans their own C + Ku satellite at 144E by April/May next year but don't expect much from it "down south"; those who have seen the closely guarded footprint map say it looks almost identical to B2P from 113E. Carriers on 144E: Try 1272IF.

Egyptian Radio & Television Union has signed agreement to occupy a full C-band transponder on AsiaSat 2. Service will launch "before end of this year" and will be targeted at "viewers in Asia and the Pacific" using Arabic and "other languages" featuring general entertainment, movies and news. Amin Bassiouny, President of ERTU in making the announcement, said "*We want to introduce to the people of Asia and Australia our country and our culture.*"

RPN-9, Filipino service on 142.5 Rimsat, did not quit 30 August; they are now using S-A PowerVu format for distribution to 14 terrestrial Filipino TV stations. Russian sources say RPN is likely to be on 142.5E using PowerVu for at least next six months. Msymbol, FEC and other relevant PowerVu data unknown at press deadline.

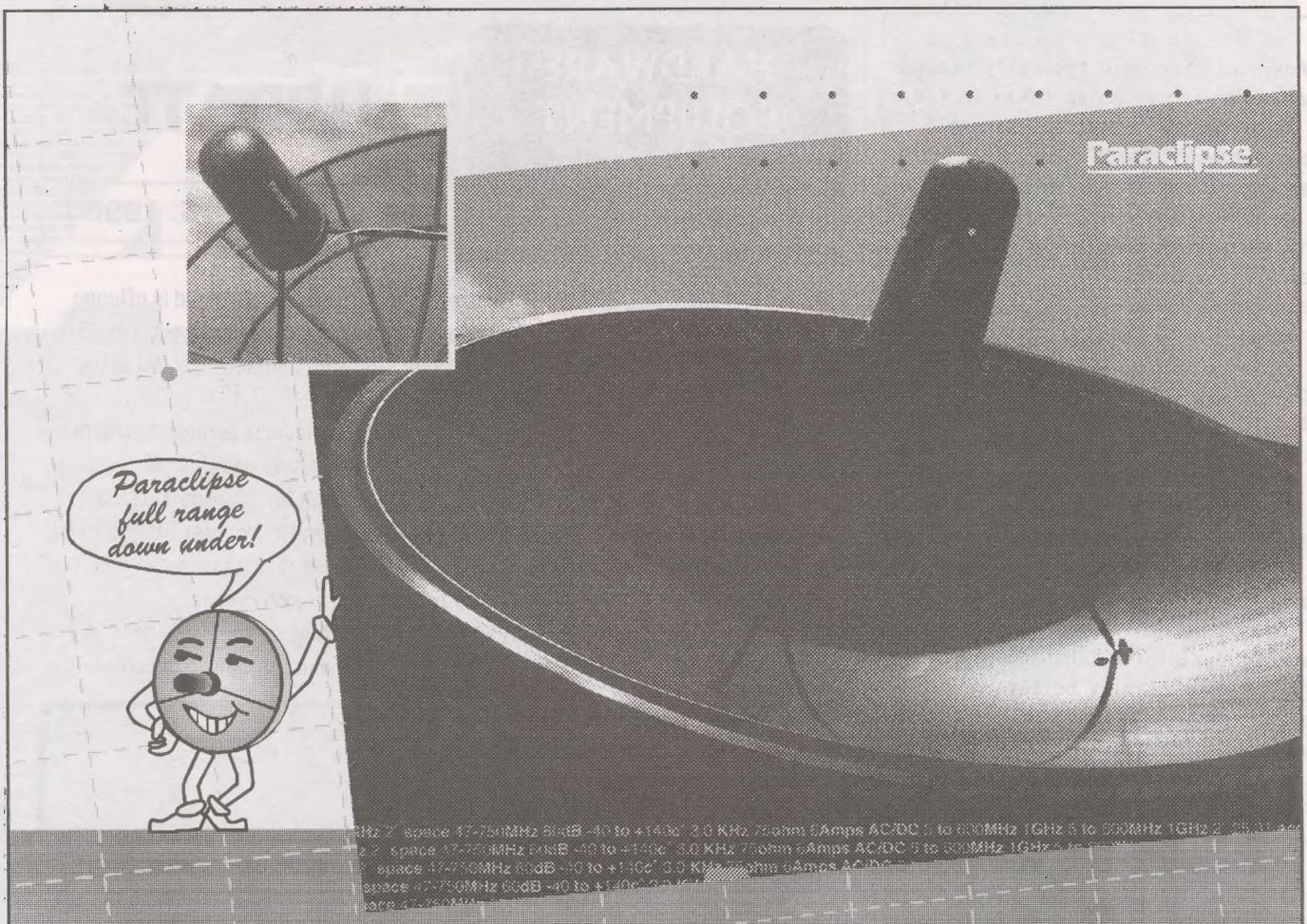


NOT so "friendly" now

Filipino Agila 1, C + Ku, is quietly advising SE Asia potential clients it will be at 154E although there has been no official announcement nor release of anticipated footprint pattern. Launch date: mid to late 1997.

AsiaSat reports a six month profit of HK$357.7 million, up 121.6% from the same period in 1995.

Gorizont S14 (96.5E) appears to have dropped Russian Orbita programme service to 1/2 power, affecting numerous private installations in Australia that previously had excellent service on dishes under 3m in size. This "powerhouse" signal (1475IF) was head and shoulders head of next best same programme source; S21 at 103.2E.



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STARnet

LETTERS / continued from page 2

Analogue threshold typically occurs at a carrier to noise ratio in the region of 8dB. Digital threshold occurs in the region of 5.5dB. If the average power for the satellite was equal to the average power for analogue, we'd have better small dish reception with digital, from the same satellite. Unfortunately, to ensure the satellite does not distort the delicate digital signals by generating intermod products within the transponder, AsiaSat and others back down the average power of the transponders by up to 6dB. On one hand God gives us a 2.5 to 3dB digital advantage while the satellite operator takes away 3 to 6dB to protect his transponder. Net result: We are forced to utilise bigger dishes for digital than we had been hyped into initially believing simply because the existing satellites must have their power turned down to avoid distorting the digital signals.

Galaxy Success in Central Australia

I have installed a 3.8m Ku rated dish and spent 10 days tuning, comparing feed horns and LNBs trying to produce a reliable 9dB C/NR on the Galaxy banana beam signal here. Finally, with a 0.8dB Cal Amp LNB and Andrews feed I can report that I have Galaxy almost 100% reliable. It still drops out twice per day when B3's unpublished inclined orbit reaches the extremes of the figure 8. Of interest, transponders 10 and 11 do not drop out at the same time nor in the same pattern: one day one goes first, the next day the other.

Les Brooks, Alice Springs

NASA tracking advises B3 is moving 0.1 degree E and W but only 0.02 north and south of equatorial spot. None of this is enough to explain the outages Les reports nor that New Zealand observers routinely see. Additional clues: Within figure 8 orbit the bird is sliding up and down 37km in altitude. We still believe the bird is unstable on its axis, rotating clockwise and then counter clockwise (corkscrew effect) on its centre causing the fringe area problems we observe. Optus is not saying and you cannot blame them. Would you admit your newest 'toy' has functional problems? Not likely.

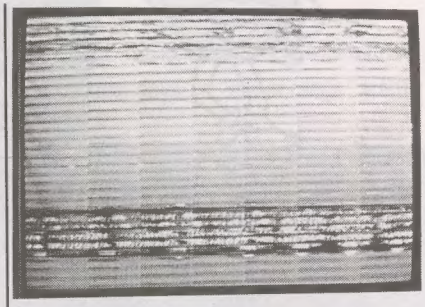
HARDWARE EQUIPMENT PARTS UPDATE

SEPTEMBER 15, 1996

S-A D9223 IRDs at a discount? Chinese Television Network Limited is offering the PowerVu unit at US$1,100 each provided you purchase a minimum quantity (5 is suggested); that is (US)$150 below the S-A direct pricing. Contact Nigel Wu at (tel) 852-2515-6374 or (fax) 852-2515-6521.

Panasat IRD520 users: Consensus is you can greatly reduce, perhaps eliminate, 'erratic behaviour' of unit by changing from your present analogue rated LNB(F) to one manufactured by Taiwan Microwave and available through Nation-wide Antenna (Brisbane: 61-7-3252-2947). Unit is 14/18V switchable and heavy user Steffen Holzt (New Caledonia) reports, "*All of my irregular reception has now disappeared; just enter the parameters* (EBB et al) *and press enter; it works every time*!"

EM TV began testing Videocrypt encoding system August 30. The encoder is located at the PNG Telecom uplink and for now EM TV must telephone the uplink to advise them to switch the encoder on and then remember to call again at the end of an encrypted event to ask them to switch it off. Problem, as always, is copyright. Station says executives of Warner Brothers, from whom they purchase 'recent' films, and, sporting interests have forced this issue. Seems that Warner personnel found EM TV on SMATV systems in New Zealand and Australia (shame!) and then advised EM TV to either encrypt the WB programming or lose it. Station ultimately believes it will be forced to encrypt all programming for which it does not own copyrights; that would include much of the 9 Australia material. Station was swamped with telephone calls September 1 and 2, some from as far away as India, asking how the caller could obtain a decoder. Answer: "*You cannot unless you are in PNG*." The market for EM TV grey market decoders could be sizeable; easily 5,000 if the price is reasonable. Stay tuned.



EM TV test of encoding

Erratic BER (bit error rates) from PAS-2 Sylmar? Several reasons: Sylmar uplink site being phased out in favour of new Napa (Ca.) site, due on line about 1 November. And, Sylmar feeds CMT et al via transponder 6K (Ku) which is cross strapped within PAS-2 for C-band downlinking. Something is not quite right in this arrangement resulting in erratic (jumping around) C-band BERs. If you have Ku ability in NZ, Australia, western Pacific try IF 1115Vt for typically better quality than through the C-band service.

Solar Eclipse time again. Alignment of sun directly behind satellite produces 'solar noise' that totally overpowers satellite signals for up to 15 minutes daily. Satellites to your east in AM, due north or south midday, to your west late in afternoon. There is no cure; grin and bear it.

JCSAT-4, originally intended for major expansion of C and Ku services beyond Japan, will go to 150E after launch in first quarter of 1997. Reason: JCSAT-1, Ku-only bird at that location has fuel leak and will be unsteerable shortly. '4' will use its Ku portion to replace ailing '1'; no word on whether C-band will be turned on from this location. '4' was originally intended for 124E and significant C-band use.

Discovery Asia made transition to PowerVu digital (PAS-2, 1374IF Hz; 19.85Ms, 3/4 FEC) August 27; now plans expansion to 4+ service channels covering kids, history, science, travelling / living and ex (USA) PBS programming.

Wrestling With The MPEG Alligator

AUSTRALIAN PLANNING for CONVERSION of RABS to DIGITAL

This paper describes a multiplexed digital Direct Broadcast from Satellite (DBS) transmission service being developed by Optus Communications. The initial focus of the service will be Remote Area Broadcasts, though other applications will include narrowcast, educational and business TV, and broadcast audio and data. For the purposes of this paper, a DBS service is regarded as a point to multipoint service intended for reception on a Television Receive Only (TVRO) antenna nominally less than 2.5M in diameter.

History

Remote Area Broadcasting Services (RABS) are direct to home television services to the remote regions of Australia, using the analogue B-MAC transmission system. They are provided by the Australian Broadcasting Corporation (ABC), the Special Broadcasting Service (SBS), Golden West Satellite Communications (GWSC), Queensland Satellite Television (QSTV) and Imparja Television (Imparja). The RABS industry also includes the Department of Communications and Arts (DOCA), Optus Communications, the National Transmission Authority (NTA) and the Australian Broadcasting Authority (ABA). The broadcasters either run their own uplink from their studio location, or lease facilities from OPTUS in the appropriate capital city. Reception requires a B-MAC set top box and an external 1.5m antenna.

At their inception in 1986 the services were carried on 30 watt transponders on the A series satellites; the NE and SE (beams) on A1 at 160E and the WA and CA (beams) on A2 (later A3) at 156E. The replacement B series satellites have wider bandwidth transponders and higher power than the A series, and are designed to deliver two analogue carriers, in offset frequency half transponder mode. Unfortunately the domestic receivers (Plessey type 2001) were only designed to tune in the 'old' A series centre frequencies. When B1 replaced A1 in December 1992, the SE and NE RABS services had to remain on their original operating frequencies, effectively doubling a whole transponder even though they were tariffed as a half transponder service. The broadcasters hoped to overcome this situation by moving to CDV (compressed digital video) delivery, and in October 1993 the Remote Area Broadcasting Technical Implementation Group was set up to develop the technical and operational aspects of a CDV RABS system.

Ironically, its first major recommendation was that no suitable CDV system was available and that a move to offset frequency B-MAC had to be contemplated. In a joint industry process all IRDs in the SE and NE zones were upgraded to receive the new frequencies and all B1 services moved to offset frequency in 1994. This involved development of a public awareness campaign, selection and agreement with software and hardware suppliers, and management of commercial and technical arrangements.

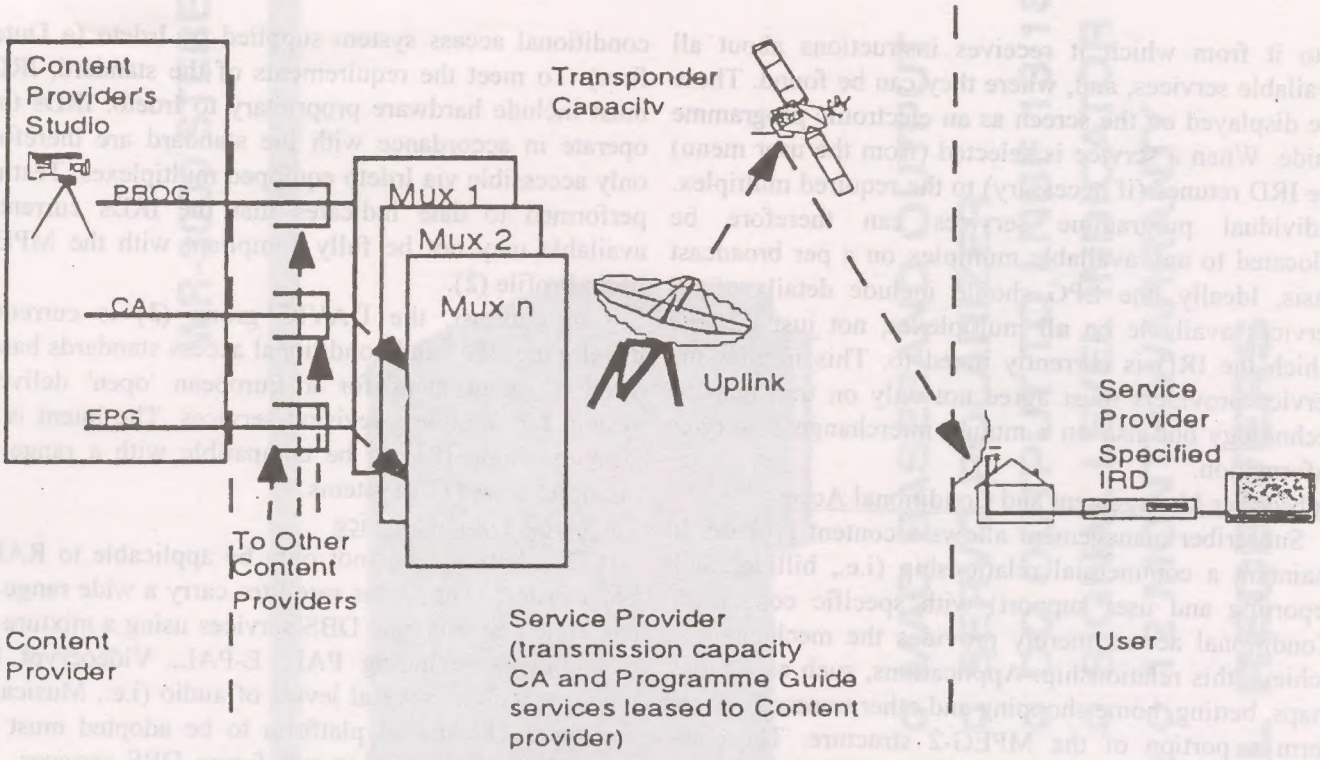
In 1995 B3 replaced the ageing A3, and the Galaxy (digital) subscription service was transferred to the new satellite. Once again the RABS services were left 'high and dry' in the centre of the transponders. This time, however, an early transition to CDV is anticipated rather than a move to half transponder for the WA and CA services.

System Architecture and Terminology

Digital delivery for DBS services will require a reappraisal of the roles for the various groups involved. To avoid confusion, the terminology used here adheres to that of Standards Australia from their publication, 'Strategies for the Development of Standards for Digital Video and Associated Services.'

Content Provider: An entity that provides the information content of signals transmitted over a network.

Nothing about the world-wide conversion from analogue to digital can be considered "good news" these days. Australia's RABS (Remote Area Broadcasting Services) presently utilises analogue B-MAC to deliver ABC, SBS and regional TV services GWSC, QSTV, and Imparja to as many as 10,000 remotely located sites. Australia plans conversion to some form of digital over the 1997 period. But which digital format will best serve these sites and how should it be configured to bring the cost of conversion for each location down to a practical minimum? Tim Mason, Broadcast Services Consultant for Optus National Media, outlines the challenges and concerns now facing Australia in this important decision area. His concerns are real and provide new insight into the types of considerations all programmers must consider when replacing existing analogue network systems with any form of digital. You will better understand the rules of this new game by reading carefully his advice to Optus.



DIGITAL BROADCAST CHAIN as envisioned by Optus

Service Provider: An entity that collects, packages, and transmits content over a network. Determines consumer's choice of integrated receiver decoder (IRD) and the facilities that can be provided.

Network Provider: An entity that operates a system for communications.

User: A general term for the recipient of a service; e.g., Residential User or Consumer Business User.

Analogue Systems

With analogue delivery there is an identifiable transmission path between the content provider and the user. In general the role of content provider and service provider is merged under the functional title of 'broadcaster.' The user's choice of IRD is determined by the broadcaster; for example, the remote area broadcaster use of B-MAC determines that the users must have B-MAC receivers.

For satellite delivery the broadcasters normally lease only network type facilities. These range from transponder only services to end-to-end transmission including uplinks and downlinks. Content providers who do not (or cannot) own their own service provision facilities can lease these as well. For example, OPTUS acts as a service provider with its managed B-MAC end-to-end narrowcast service that includes conditional access, encoding and transmission.

Digital Systems

CDV systems designed for DBS are generally multi-channel per carrier (MCPC). All of the multiplexed services share the same transmission medium, conditional access (CA) system and equipment configuration. The multiplexer is operated by a service provider, within the multiplex. This includes the assembly and transmission of an electronic programme guide (EPG) which provides information to users about the services available from the multiplex. The user's choice of IRD is determined by the service provider since the IRD must be compatible with the selected multiplexer and CA system.

Conditional Access

Conditional access allows a receiver to decode and display a particular programme from a particular content provider. This is a major component of any CDV system (1). The CA system performs two separate functions. Firstly, it encrypts and transmits the Entitlement Control Messages (ECMs) which carry the code word used to scramble the programme data. Secondly, it encrypts and transmits the Entitlement Management Messages (EMMs) which address the individual receivers (IRDs) and permits them to perform the de-scrambling. Generally while the programme scrambling is to the DVB (MPEG) standard, the EMM and ECM encryption processes are proprietary and different in all CA systems. The ability of the IRD to decode and decrypt the CA data is defined by a combination of the smart card and the operating software within the IRD.

Programme Selection and Electronic Programme Guide

Users of a CDV system do not tune to a particular frequency or transponder to receive a particular service. In fact most IRDs do not have a tuning control available to the user. The IRD has a home channel programmed

1/ Conditional access is not mandatory to operate a CDV system. European Bouquet, FTA digital, will remain non-conditional access which reduces the user cost for the receiver as well as eliminating any programme use fees.

into it from which it receives instructions about all available services, and, where they can be found. These are displayed on the screen as an electronic programme guide. When a service is selected (from the user menu) the IRD retunes (if necessary) to the required multiplex. Individual programme services can therefore be allocated to any available multiplex on a per broadcast basis. Ideally, the EPG should include details of **all** services available on **all** multiplexes, not just the one which the IRD is currently tuned to. This implies the service providers must agree not only on transmission technology but also on a mutual interchange of service information.

Subscriber Management and Conditional Access

Subscriber management allows a content provider to maintain a commercial relationship (i.e., billing, fault reporting and user support) with specific consumers. Conditional access merely provides the mechanism to achieve this relationship. Applications, such as weather maps, betting, home shopping and other transactions can form a portion of the MPEG-2 structure. These are transmitted as data, and only at the IRD is this data converted to so called 'virtual channels.' Provided they adhere to MPEG/DVB standards, their transmission is transparent to the multiplex operator. There is, however, an implication for conditional access and service information (data) carriage.

Choice of Multiplex and Conditional Access

International **transmission** standards for CDV are well defined. There are MPEG-2 and DVB specifications for the encoding, scrambling, delivery and reception of CDV. However, these specifications are not sufficient to define a complete system. In particular, conditional access and integrated receiver decoder (IRD) functionality are not defined (by standard).

(Within Australia) There is no legislated standard for the overall delivery of narrowcast or free-to-air (FTA) services. One possible system is defined by the Australian Subscription Television Standard. It uses a conditional access system supplied by Irdeto (a Dutch firm). To meet the requirements of the standard, IRDs must include hardware proprietary to Irdeto. IRDs that operate in accordance with the standard are therefore only accessible via Irdeto equipped multiplexes. Testing performed to date indicates that the IRDs currently available may not be fully compliant with the MPEG Main Profile (2).

In contrast, the DAVIC group (3) is currently developing IRD and conditional access standards based upon a requirement for a European 'open' delivery system for satellite television services. The intent is to allow a single IRD to be compatible with a range of multiplexer and CA systems.

The Optus Digital Service

CDV delivery will not only be applicable to RABS broadcasters. The Optus satellites carry a wide range of part time and full time DBS services using a mixture of technologies including PAL, E-PAL, Videocrypt for video as well as several levels of audio (i.e., Musicam) and data. The digital platform to be adopted must be applicable to all existing and future DBS services. As well as FTA and narrowcast television these could include home shopping, educational and corporate training channels, plus audio and data distribution. Locating all of the services on a single satellite (B3 is the preferred satellite at this time) means that they should all be available to the user via a single antenna and set top box.

The Optus digital platform will be based as far as possible on open, non proprietary international standards. This will encourage a diversity of potential set top box suppliers. An open system will also allow content providers to deliver a range of value added services secure in the knowledge that these will be compatible with all receiving equipment. It will also mean that other service providers (or broadcasters) will have the option to provide their own multiplexed services using the same transmission standards previously put into use, and reach the same population of existing IRDs.

System Architecture

In a CDV system there is no reason why a service must be associated with a specific transponder. The Service Information carries all of the data required for the IRD to select and decode the selected channel. It is possible, therefore, to connect all inputs to all multiplexers and to use the multiplexer control system to allocate individual services according to need.

Satellite Beams

Depending upon the uptake for new and existing services, it is intended that the digital services will be available in National, WA, SE/NZ beams on the B3 satellite. Current plans are for the WA spot beam to uplink from Perth (Lockridge) while all other services to be uplinked from Sydney (Belrose). The broadcaster will have the option of providing their own encoding,

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2/ "Interoperable" is the term applied to receivers which will function with a variety of multiplex sources. In extensive testing performed by Intelsat Labs, with 12 multiplex sources, the best receiver reviewed operated with 5 sources (and did not work with 7). For detailed review of this subject see Coop's Technology Digest (CTD) July 15, 1996.

3/ DAVIC (Digital Audio Visual Council) is an open standards association with 150 members (individual firms, broadcast groups such as BBC and nations such as Germany). Ultimate success of DAVIC is not guaranteed as they represent another 'layer' of standards bureaucracy on top of those already existing. Their worthy goal is inter-operability and compatibility.

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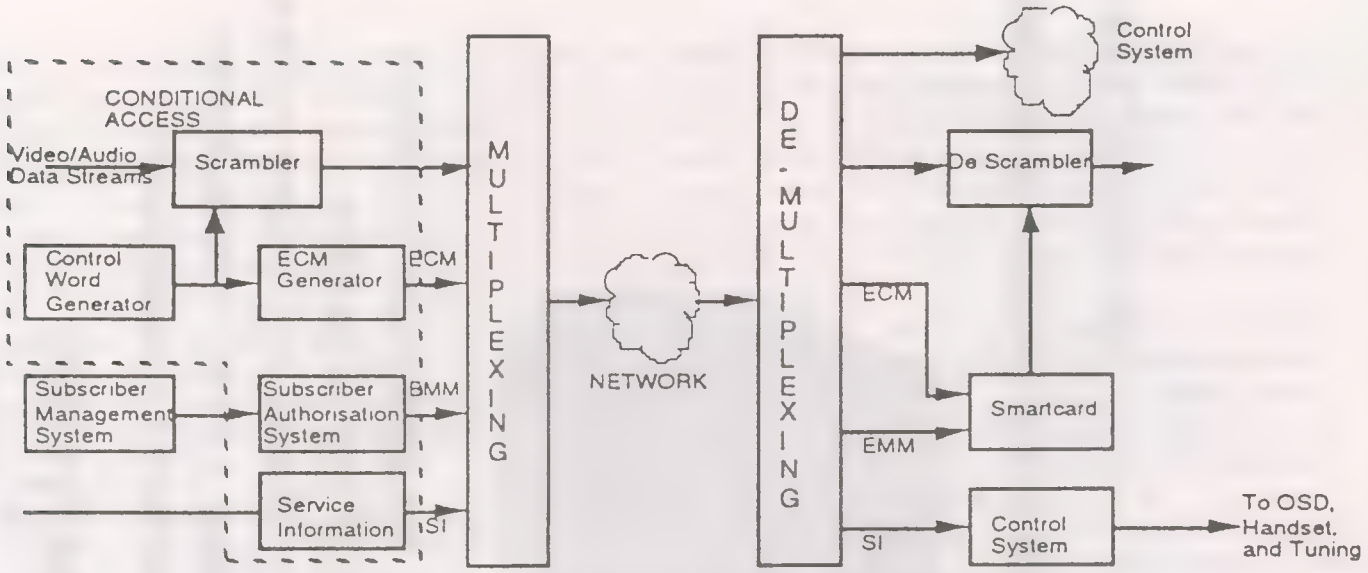


Proposed Optus Multiplexer and IRD Interworking

subscriber management, or, deliver in analogue to the uplink site to an encoder provided by Optus.

Services currently delivered using the Central and NE beams will be transferred to a national beam with geographic limits (i.e., who is allowed to view, where) imposed by the conditional access system. This is partly because the existing users of these services have indicated a preference for National beam delivery. Also, the only transponders capable of operating in the NE and CA mode are those which can also be operated in the High Performance (HP) beam and their operation as spot beams would unduly limit the capacity available for DTH subscription broadcasts. (4)

Smart Card Management

A key requirement of the Smart Card Management System (SMS) is to allow a user to be able to receive any service using a single smart card that will be associated with the IRD at the time of purchase or lease. There will of course be content providers who wish to issue their own smart cards which will be used to authorise only their own services to designated IRDs. The SMS will therefore need options that allow single user smart cards to be obtained from either Optus, or a third party, but in each case still accessible via the Optus Open System.

Overall Service Offering

The service offering will include conditional access, network management, and service information (SI; also called System Information). It will be designed to provide the security and individual control available now using existing 'closed architecture' analogue systems.

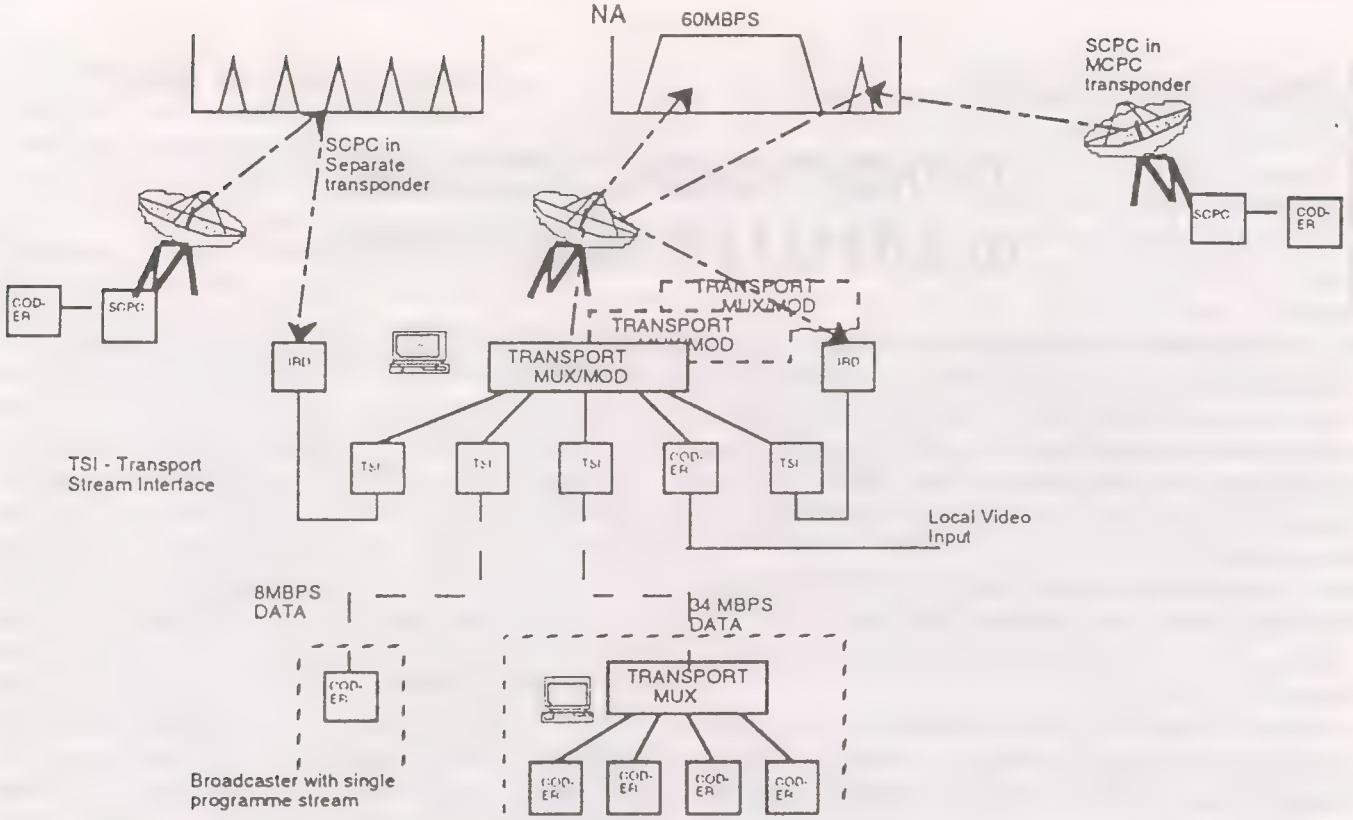
The initial requirements of the conditional access system are to support Remote Area Broadcast and narrowcast (e.g. business and educational service) applications. This will include geographical and time/geographical blackouts/access for free-to-air programs as well as a basic electronic programme guide. The conditional access system will provide multiple interfaces for the use of a provider's own subscription management systems. The DVB standard also allows for the use of proprietary conditional access data to 'pass through' the service provider's multiplex. It is likely that the Optus subscriber management service, as well as support for higher level applications such as electronic programme guides, will be developed in conjunction with a subscription television operator.

Service Level

The concept is to deliver the National Beam satellite signal to the consumer/business premises throughout the major populated areas using a nominal 1m antenna (dependent on service availability requirements and exact location). Less populated and/or higher rainfall areas may require larger antennas. The design availability target is nominally equivalent to existing B-MAC half transponder spot beam. This equates to a 99.8% annual availability assuming a 9dB C/N, 21 MHz bandwidth, with a minimum 4dB clear sky margin. The equivalent digital service is 99.8% availability using DVB specification Eb/No plus 1 dB implementation margin and a minimum 4dB clear sky margin. (5)

4/ This appears to suggest a transfer of Galaxy to the National (HP) beam as well; good news for the central and northern regions of Australia where as a letter appearing on page 4 here this month indicates, Galaxy reception presently requires extraordinary effort.

5/ A 4dB "clear sky margin" means the carrier signal is 4dB above threshold with no rain bearing clouds in the sky on the heading to the satellite. This allows for a maximum downlink degradation of 4dB during a heavy rain storm, at which point the margin is 0dB and any further reduction will result in mosaic patterning ('tiles').



The conceptual RABS system as proposed by Optus

VGM Operation

The transponders will operate in a Variable Gain Mode. By sensing the amount of uplink rainfade, an AGC system on board the satellite maintains a constant level from the satellite to the receivers over a range of 21dB of uplink power variation. In conjunction with an Uplink Power Control (UPC) this can provide up to 30dB of uplink rainfade compensation.

Available Data Rate

The transmitted data rate is limited to 30Msym/s (60 Mbps) by the capability of existing IRDs. In practice, assuming replacement of LNBs and careful alignment of the receive antenna, National Beam performance should be acceptable to the majority of the consumers at an FEC of 2/3 which leads to a user (data) rate of 36 Mbps.

Network Architecture for RABS

It is likely each RABS operator will wish to encode and multiplex their own video, audio and data streams together at their respective studios. All services (including those that could uplink directly) must then be delivered (via backhaul satellite feed) to the common multiplex uplink site. For those who have access to the Optus fibre network a composite digital signal can be delivered directly to the earth station.

Alternately the backhauled satellite signal might be provided as a digital SCPC on the satellite. An SCPC could also be used to provide head end and re-transmission performance. The space segment capacity of an SCPC could also be reduced using more efficient modulation (such as 8 or 16 PSK). The provision of an SCPC service within the transponder alongside the MCPC is also believed to be technically possible. (6) This option, however, would reduce the performance of services carried within the main MCPC carrier. Some of the anticipated SCPC sharing with MCPC challenges are:

1) Reducing the available EIRP. Tests conducted to date suggest this effect is less than 1dB.

2) Marginally reduce the effectiveness of the Variable Gain Mode.

Compatibility with Subscription Standard

Open systems are not incompatible with the subscription standard. At least two IRD manufacturers have specified that they can produce IRDs with both Irdeto hardware type and DVB/DAVIC software type systems co-resident. The DVB standard also supports a system known as 'simulcrypt.' This allows the encryption code words for any programme to be transmitted using more than one CA system. The programme can therefore be received on IRDs equipped with either CA system.

Timetable

The first services are planned for the latter portion of 1996 with as many as five transponders carrying broadcast (free to air) and narrowcast programmes. The expansion of the satellite subscription services in mid 1997 is expected to require additional transponders.

6/ Perhaps. Tests conducted by PanAmSat where MCPC has been mixed within a single transponder with analogue have produced troublesome results. Example: Sharing of vertical transponder on PAS-2 by Australian analogue The Value Channel, and, Chinese MCPC uplink CCTV3 and CCTV4 has demonstrated "power balance" is very difficult.

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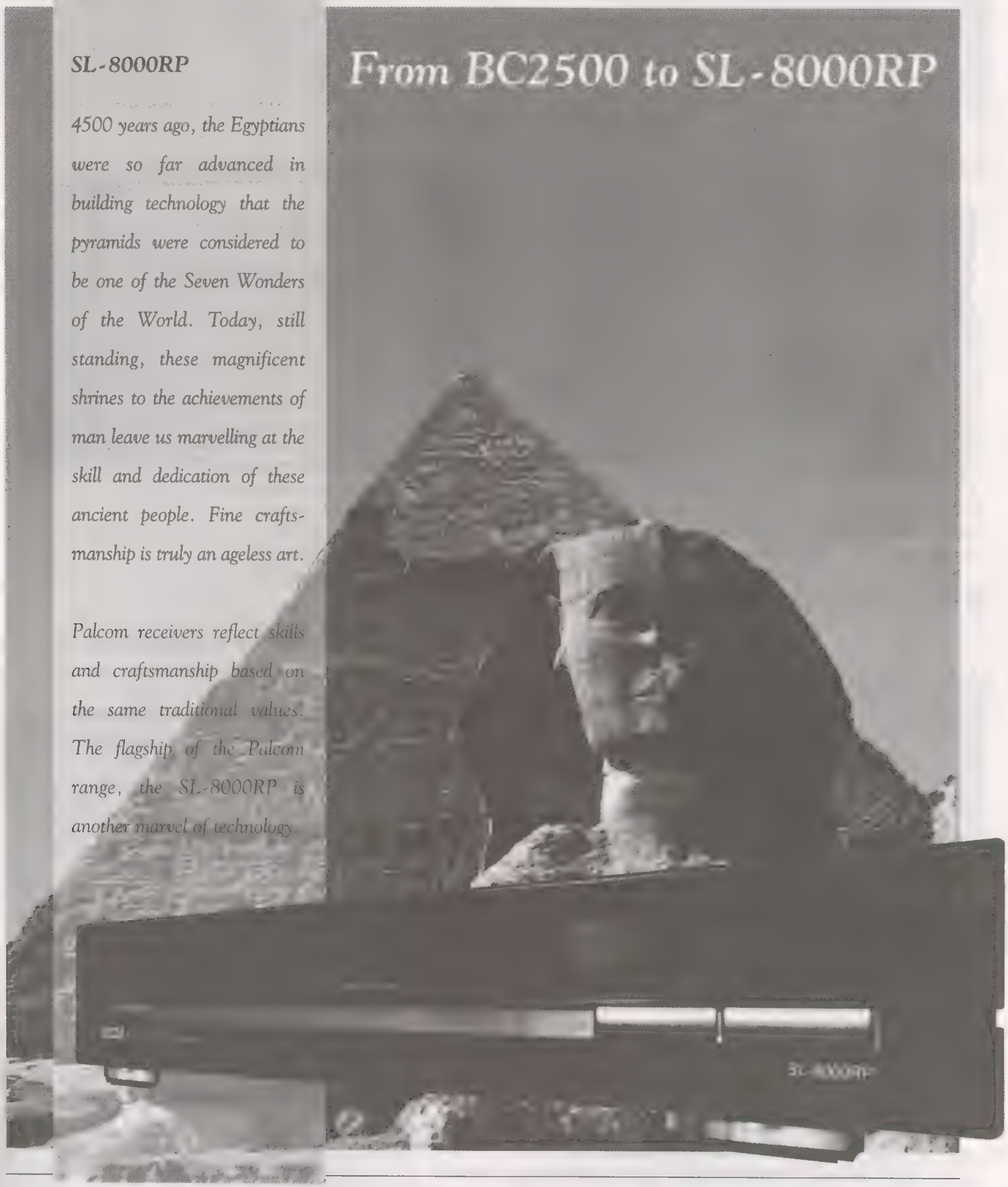

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Adios Baywatch

THE PACIFIC COPYRIGHT NOOSE TIGHTENS

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An executive of Papua New Guinea's EM TV tells the following story about his TV station's inauguration of encrypted programming on 30 August:

"*Executives of Warner Brothers checked into a New Zealand motel and were surprised to find EM TV distributed into their room from a rooftop satellite antenna. That same week while staying at a resort in Queensland, they again found EM TV on their TV dial. The pair was on a business trip and the next stop was Port Moresby. We wanted to purchase a considerable amount of programming from them. 'First,' they told me, 'clean up your coverage. When you get encryption equipment which will shut off unauthorised viewers outside of PNG, then we will sell you programming.'* "

EM TV first began talking about encryption last January. At the time they were being denied access to a series of Cricket matches because ESPN had protested to the Cricket officials EM TV was being carried by hundreds of Indian cable TV systems. ESPN, having paid money for the 'exclusive cable distribution' of these matches in Asia was not pleased to find EM TV, free to air, carrying the same matches into Indian cable homes as they were trying to sell on a pay-TV basis.

Manila RPN-9 went to satellite in July, linking their metropolitan service to 14 scattered retransmission sites within the Philippines. RPN-9 already had programming rights to a host of American created programmes. They were warned, "*Encrypt the satellite transmissions or lose these programmes.*" (1)

Our EM TV exec blames "publicity" for some of his problems. "*Magazines such as SatFACTS made it well known that EM TV was being received and used by cable and SMATV. If everyone had played it cool, and kept quiet about the coverage we have via satellite, we might not have been forced to scramble.*"

BBC launched "the world's first public television service" November 2, 1936 (Yes - there will be a 60th anniversary shortly). This off-screen photo, shot on that date by a Pye Ltd. engineer, warned against violation of the BBC copyright with "public entertainment" (i.e., showing the programming in a public place). The copyright squabble roots are indeed deep (photo courtesy 405 Alive).

It is difficult to keep something like this a "secret."

Analogue encryption schemes were first introduced in 1981. In the decade that followed hundreds of differing analogue systems have evolved. Here in the Pacific and Asia, B-MAC remains the market leader and although the system has been 'hacked' by European pirates, the hacked versions have never caught on in our marketplace. The history of hacking starts shortly after the first encrypted system appeared.

Hacking involves a number of disciplines and those with a serious interest are encouraged to subscribe to Hack Watch News (2), an Irish publication which sends shivers up and down the backs of TV programming encryption departments world-wide. 'Hacking' means someone has modified the operation of a decryption device to allow reception of programming without payment of a fee and without knowledge of the programmer that the decoder is delivering reception.

1/ RPN-9 switched from FTA analogue NTSC to S-A PowerVu late in August.

2/ McCormac's Hack Watch News, 22 Viewmount, Waterford, Ireland. jmcc@hackwatch.com

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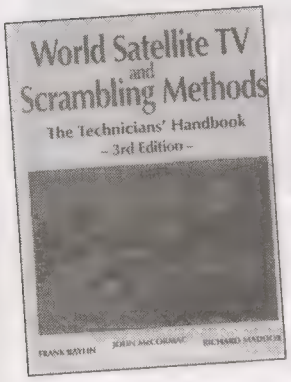

Known as "the technicians' handbook", this text is a must buy for technicians, satellite professionals, and enthusiasts. The design, operation, and repair of satellite antennas, feeds, LNBs and receivers are examined in detail. An in depth study of scrambling methods, and broadcast formats is the backdrop to a discussion of all current American and European satellite TV technologies, including the Videocypher II, Oak Orion, Filmnet, UK Sky Channel, EuroCypher, D2MAC, BSB and Teleclub Payview III. Circuit and block diagrams of all components are presented and clearly explained throughout the book.....$79

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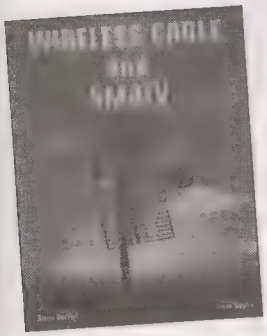

A comprehensive study of the new broadcast method, Wireless Cable, and the closely related field of satellite master antenna TV systems (SMATV). Three chapters are dedicated to details of the site survey, planning and design phases of a private cable system. Off air and satellite headends and all components from antennas to processing and mixing electronics are studied in detail. Ideal for those considering an MMDS installation. $89

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A 76 page complete description of MMDS television systems. This first edition, published in 1995, contains thirteen comprehensive chapters covering all aspects of system design, and shows actual on-air configuration of a 31 channel MMDS system. A valuable reference for anyone involved in installation or maintenance of an MMDS system, "The wireless primer" shows how one operator in the USA saved $100,000 on hardware by following the designs in this book!! $45

1995/96 WORLD SATELLITE YEARLY

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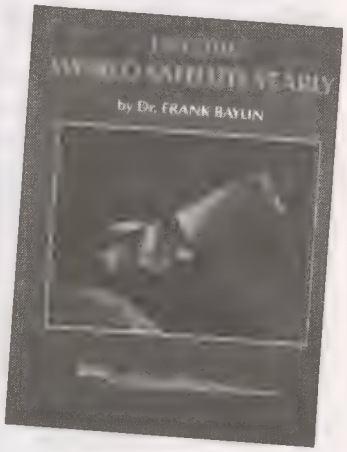

The 768 page 1995/96 World Satellite Yearly contains the latest information about satellites, technology and programming. Features updated chapters on audio and video compression, footprints for satellites launched during 1994 and projected for 1995/96, and worldwide programming assignments. The ultimate reference book on satellite TV footprints, programming and technology. $140

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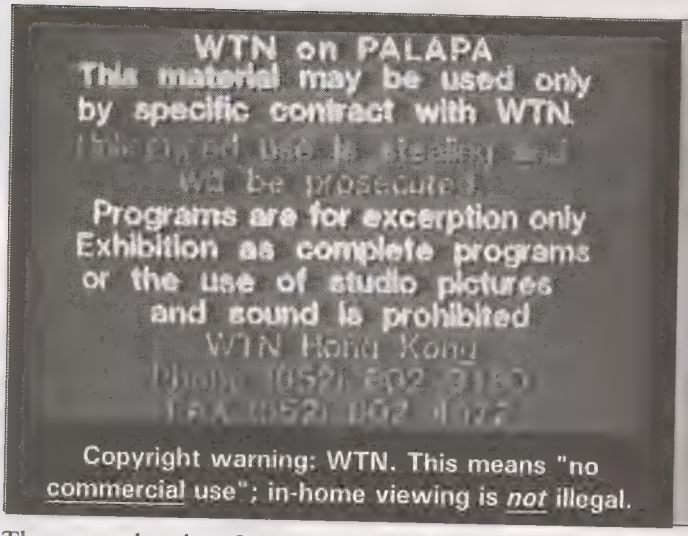

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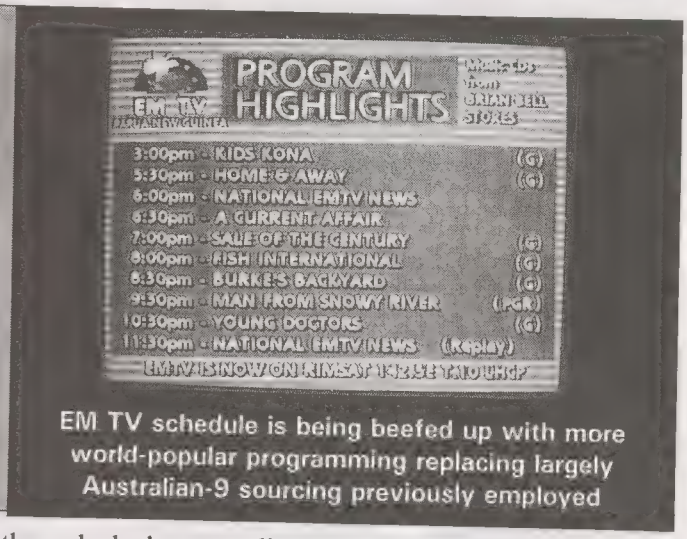

EM TV schedule is being beefed up with more world-popular programming replacing largely Australian-9 sourcing previously employed

There are levels of encryption and the most complex systems utilise both conditional access (module or circuitry built into an IRD) plus a 'smart card.' A review of Hack Watch News suggests the CA module is quickly circumvented while the smart card requires some skills to force "on" without approval of the programme authorisation centre.

EM TV has selected Thomson VideoCrypt's SV3 (or SV3A) system. This is the same system utilised in New Zealand for UHF terrestrial pay TV broadcaster SKY Networks. EM TV advises, "*Anyone with an SV3 decoder will be able to receive our encrypted programme portions for the next two months. After that point, a smart card will be required.*" EM TV has elected to distribute the SV3 decoder (**3**) directly, not through dealers nor distributors. They will also handle the companion smart cards. The SV3 price is K160; a very fair price considering the original cost of these units. Pricing for the smart card has not been announced. (**4**) "*Decoders will not be sold outside of PNG*" according to a station spokesperson; not even in Solomon Islands (**5**).

After testing of VideoCrypt August 30 and 31, EM TV trotted out its new programme schedule and encryption. The first programme to be encoded was Baywatch, not previously shown by EM TV, and future US sourced programming such as Lois & Clark: Superman as well as some sport programming (i.e., Formula 1 Racing) will be encrypted. EM TV recognises that every time it pushes the encryption switch (for a particular programme) their audience becomes minuscule even inside PNG (virtually no SV3 units had been distributed when encryption began). They plan to "ramp up" the encryption frequency, delicately balancing the demands of their programme suppliers and the cries of protest from their audience. Programming which EM TV creates within PNG and to which they hold the copyrights will not be encrypted.

"*We are not turning into a pay television operation; that is not the purpose of our encrypting. If we continued to reach the region from India to New Zealand and beyond without encryption, we simply could not purchase for our use the popular programming that the PNG viewers are demanding. From our perspective, encryption is a necessary evil and expense. We don't like it but have been forced into it.*"

There is a legal question here. If EM TV is not a pay service, is not available on subscription, how then does it fit into the Australian regulations? It is a sometimes free to air, sometimes encrypted service with a majority of its programming originating inside of Australia (through channel 9). Those outside of Australia must rely upon their own national copyright laws and the relationship of those laws to Australia. EM TV scrambling raises more questions than it answers.

3/ SV3 decoders are baseband (video in) devices; the audio is not encrypted. The original commercial packages for SKY Network utilised the SV3 but these units have been taken out of service in all but a handful of motels in NZ. The SV3 connects up like a CDE-2000 for Indovision: receiver baseband output (unfiltered, unclamped) to SV3 input; SV3 output to TV monitor or modulator.

4/ Smart cards for the SV3 will be series 1, 2 or 3; SKY presently uses series 3. In the UK, repeated "hacks" of VideoCrypt smart cards has caused SKY Europe to advance to the present series 10 cards; each new series represents an attempt by the programmer to increase the security of the cards by raising it a level in complexity. European satellite publications routinely advertise for sale hacked versions of all smart cards from series 1 through 10 as well as grey market VideoCrypt decoders.

5/ Refusing to accept viewers in (the) Solomon Islands is a peculiar statement for EM TV given the presence of PNG military personnel on Solomon and territorial claims of PNG. A pay TV terrestrial broadcast company does plan a 1997 start of service to Honiara, however, which means to a firm such as Warner Brothers that they would consider Solomon as a distinct market from PNG.

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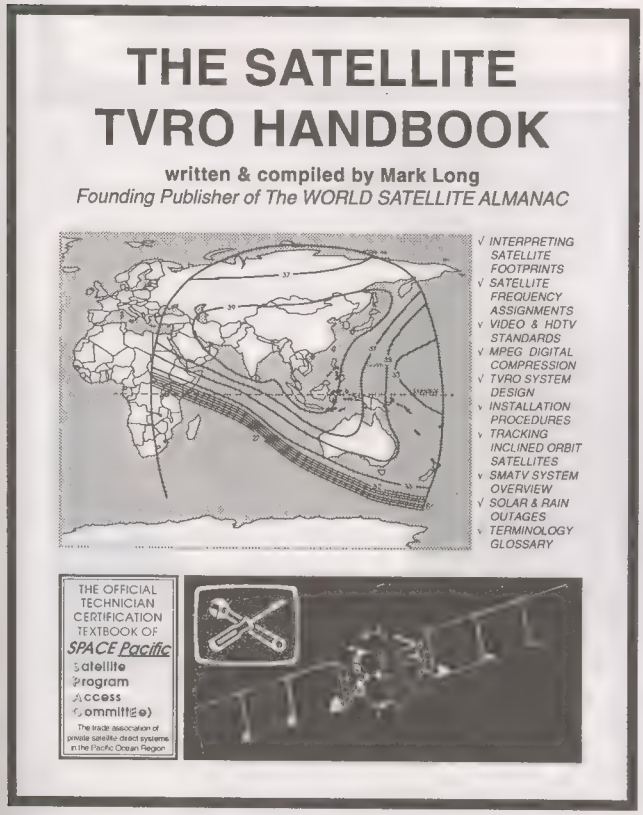

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Drawing The Line With IRD 'Hacks'

TVRO enthusiast Robin Colquhoun, an early pioneer in the development of private satellite dishes in New Zealand, had acquired a Scientific-Atlanta D9222 IRD during July 1995. He purchased the unit directly from S-A Canada not wishing to deal with the local distributor. He initially had the unit authorised for CMT, later CCTV was added through SPACE as one of the first two NZ IRDs to get this service. Ultimately he would develop a telephone relationship with an employee at PanAmSat and his D9222 would be authorised (quite above board) for a number of additional services (including ABN).

During SPRSCS '96 he showed off a software programme he had created for remote control of the S-A receiver. This caught the attention of another Australian member of SPACE who had a need to remotely tune D9222 units from Korea to NZ and points between using a telephone modem. Colquhoun's software programme was put to work and in the process he became acquainted with several additional S-A technical people from Canada to Australia.

When the D9222 was to be replaced with the D9223, Colquhoun's uniquely authorised receiver presented a special problem since it took feeds (at his selection) from not only the California PAS-2 uplink but also the Hong Kong uplink. The Sylmar feed was transferred to PowerVu (and the D9223) first, the Hong Kong feed would follow by several months. How would the D9223 for Colquhoun be configured to allow it to function with both the Sylmar new format and the Hong Kong 'old' (D9222) format simultaneously?

SPACE MEMBER Robin Colquhoun believed he had found a hidden treasure buried inside the D9223

S-A asked that Colquhoun send his new D9223 to their Sydney office for a "software retrofit" which they hoped would give the receiver the ability to function with both the old and new formats. When he received the software-modified receiver back in NZ, he found it did more than this: It also had the ability to tune-in some previously forbidden feeds. Such as? NBC Asia, Galaxy on Ku, the European Bouquet and even some additional AsiaSat 2 and PAS-2 feeds. Had this software

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Membership in SPACE Pacific is open to any individual or firm involved in the "satellite-direct" world in the Pacific and Asia regions. There are four levels of membership covering "Individuals," the "Installer/Dealer," the "Cable/SMATV Operator," and the "Importer/Distributor/Programmer." All levels receive periodic programme and equipment access updates from SPACE, significant discounts on goods and services from many member firms, and major discounts while attending the annual SPRCS (industry trade show) each January in Auckland. Members also participate in policy creation forums, have correspondence training courses available. To find out more, contact (fax) 64-9-406-1083 or use information request card, page 30, this issue of SatFACTS. Page space within SatFACTS is donated each month to the trade association without cost by the publisher.

modification turned his D9223 into an "access everything" box?

Simultaneously another SPACE member had ordered several D9223 receivers acting on the promise found in S-A literature published early this year. That literature claimed the D9223 was "MPEG-2 DVB compatible." As reported in SF #22 (p. 6), 23 (p. 18), and #24 (p. 18) after repeated attempts to get the assistance of S-A to reconfigure the receivers for dedicated cable TV system use on the European Bouquet, we had come to the reasoned conclusion (backed up by statements from S-A personnel) that this could not be done.

Coop's Technology Digest (CTD) for August 23 (1996) reports on a variation of the 'Colquhoun Solution' uncovered by SPACE member John Lynam of Baysat. Lynam with the assistance of others discovered a front panel keyboard 'routine' which allowed him to programme a D9223 for use with several PAS-2 services which previously had not been available to him. Shortly after this discovery and verification by others who tried it (i.e., it was not a fluke), Colquhoun then displayed his own D9223 with its S-A unique software receiving the European Bouquet and other services to Lynam and others in NZ (a "BUT - can you top this???" exercise).

After suitable investigation it is apparent nothing has been 'hacked' in either case. Colquhoun may be more 'software literate' than the average D9223 user, and he may have some information which S-A has chosen for their own reasons not to share with others, but neither Colquhoun nor Lynam are using 'routines' which result in accessing any PowerVu feeds which S-A labels as 'conditional access.' To be sure, Colquhoun has been able to make his S-A modified D9223 access EBB and other non-PowerVu services which to the best of our knowledge no other D9223 user has been able to duplicate. We cannot explain why S-A modified the Colquhoun receiver in a way that allows it to tune-in the very services (i.e., EBB) which S-A repeatedly has insisted to other users are not available.

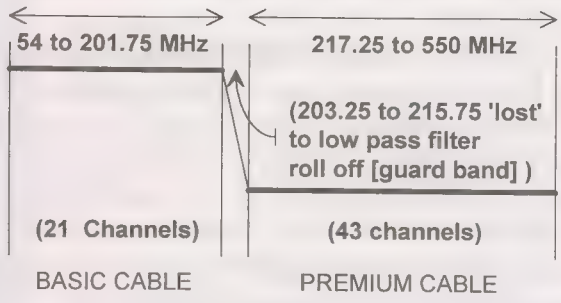
Lynam's work has been less sophisticated than Colquhoun's but lacks the ability to tune-in many of the MPEG-2 DVB services Colquhoun has available. Lynam has chosen to share his information; Colquhoun maintains he is under a 'secrecy oath' with S-A, a condition to their modifying his receiver. It is more likely Colquhoun simply chooses not to share his information as a matter of personal decision. It is also likely S-A in modifying his receiver for the original purpose (i.e., accessing both the old style D9222 transmissions as well as the new PowerVu services) equipped his D9223 quite accidentally to work with EBB and others. To the best of our knowledge S-A, after the Colquhoun software modification, has not been willing to reconfigure other receivers in a like manner.

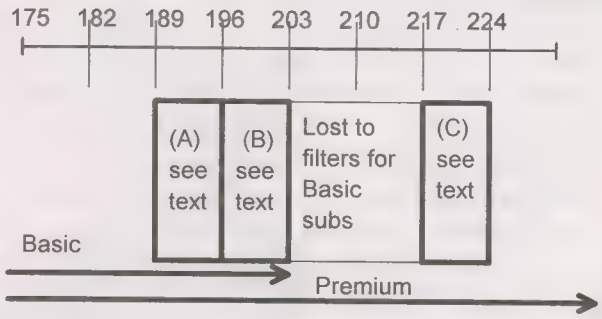
All of this took place during July and August. More recently has come word that a Korean group reports results similar to Colquhoun but without any assistance from S-A. That the D9223 'guts' are manufactured for S-A by a Korean facility may or may not be a relevant coincidence.

The dilemma facing SPACE is this. Just how much of this 'programming detail' should be released in print? The tip of the iceberg has already been published in CTD and this was done only because it appeared to have the sanction of at least PanAmSat personnel (see CTD 96-06-29, p.10). With the 'Korean Solution' anticipated, how should it be handled?

Piracy is not a viable answer and piracy in this case is the use of 'hacking techniques' to acquire access to programming protected by conditional access. But in as much as PowerVu programme streams using conditional access have not been accessed, where should the line be drawn? EBB and NBC (Asia) are not conditional access and instructions to access them outside of S-A assistance seems to be a neutral area. *What do you think?*

The CABLE Connection





TIERING: Three

If the cable spectrum starts at around 50 MHz and extends to 550 MHz (SF#24, p.24), one of the choices is apportioning of the spectrum into functional tiers or service layers. While it is convenient to view the full forward direction spectrum as a contiguous bandwidth which goes to each subscriber premise, the reality is quite different. In the real world the cable system delivers at least to the curb front the full bandwidth. At the curb, through the subscriber tap-off device and immediately after, the cable operator has the ability to selectively pass or not-pass down the subscriber drop cable portions of the full bandwidth.

The decision to break the bandwidth up into segments is marketing driven; the cable company believes it should offer more than a single level of service and to do this it apportions the full available spectrum into chunks. It then becomes an engineering activity to implement a service based upon delivering only portions of the full bandwidth to subscribers.

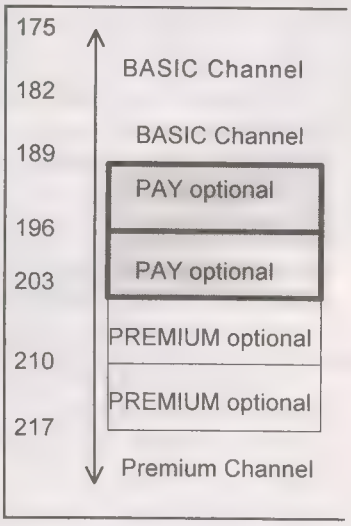
One approach (there are many) is to establish as a marketing decision the following levels of possible service:

1) Basic: Some number of channels offered for the lowest price available;

2) Premium: A greater number of channels offered for a larger price;

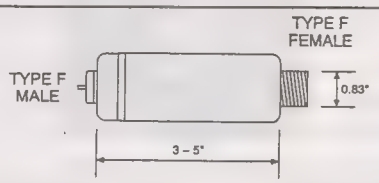
3) Pay TV by channel: One channel at a time which can be selected 'optionally' by the subscriber in addition to either Basic or Premium.

The cable operator elects to group some quantity of channels on the lowest cost "Basic" tier. As an example, by starting at 54 MHz and going to 202 MHz, there is room for 21 TV channels spaced at 7 MHz intervals (PAL B). At the cable subscriber connection point (directional tap) a "low pass filter" is installed which allows 54 - 202 MHz to go through but it stops any signals above 202 MHz. To connect a home to "Basic" cable, this lowpass filter becomes the tier control device. Because it is located inside of the cable firm's equipment pedestal, at the curb, it is relatively secure from tampering.



If from the same pedestal and directional tap a second home wishes "Premium" service, the installer simply eliminates the lowpass filter on this subscriber's drop line. In effect, the lowpass is a negative device. For each home taking Basic only, you install the filter to eliminate the Premium channels that are on the cable above 217 MHz; for the Premium homes, no filter is required.

The 'skirt' on a filter is not immediate; if your design calls for passing 54 to 202 MHz, the filter begins to roll off (attenuate) signals just above 202 MHz and requires approximately 14 MHz (the width of two PAL B TV channels) to complete the attenuation drop-off. In the example diagrammed above, a TV channel at 203 MHz and the next one at 210 MHz would, if used by the system, still be received in a degraded fashion by the "Basic" subscription home. This is the 'roll-off' (guard band) region and nominally the system would not use these two channels to 'protect' the integrity of the Basic tier.



TRAPS and decoding filters are housed in metallic cylinders and insert "in-line" with subscriber drop

There is a way to use these channels and not lose this spectrum. In our diagram we set aside 189 and 196 MHz which are the top two channels within the Basic tier as "optional Pay-TV" channels. We also set aside 203 and 210 MHz as "optional Premium-Pay channels."

This creates an island of four optionally available pay TV service channels in the middle of the spectrum. Each of these channels would be encoded on the cable in a manner to require individual channel decoders at any home electing one or more of the optional Pay-TV services.

Two of these channels (189 and 196 MHz) would be available to either a Basic (i.e., Basic + "pay") or Premium level subscriber. The remaining two, falling inside of the guard band (roll off region) of the low pass filter for Basic, would be available only to the Premium (i.e., Premium + "pay") subscribers.

Channel-specific encoding is accomplished a number of ways. The lowest cost, reasonably secure method is to "jam" or "interdict" the channel with a signal or signals that make viewing impossible. The jamming signal is added to the channel through the modulator at the cable headend. A TV set tuning in the "jammed" channel seems only wavy lines and usually incomprehensible audio. For homes subscribing to the optional pay service the decoder is installed at some point in the line from the directional tap to the TV receiver (inside of the pedestal, or, to the back of the set-top converter).

Jamming carriers are removed at the home with a non-powered passive device known as a "positive trap." This is a highly temperature stable signal trapping device that eliminates the jamming carrier leaving the channel "clean." The jamming carrier approach is typically limited to cable frequencies below 300 MHz because of the limitations of trap design.

Sideband Interdiction System (SIS) is a more sophisticated method that begins at the headend where a portion of the channel's own visual sideband information is processed in phase and amplitude for reinsertion on top of the normal programme channel energy. At the home a passive decoding filter returns the sidebands to their original amplitude and phase producing clean video and audio for subscriber homes.

Neither positive encoding nor SIS in any way disrupts the carrier balance within the system amplifiers. This allows the cable plant to be set up (levels adjusted, system tilt established) without regard to whether individual channels are clean or encoded.

Positive encoding will in some applications be difficult to do when the immediately adjacent channels are in use for non-encoded signal delivery. In the worst case for our example shown, Basic cable on 182 MHz and Premium cable on 217 MHz might have to be avoided if all four of the optional pay channels were in use by the system.

SatFACTS Pacific Ocean Region Orbit Watch: 15 September 1996

Free-to-Air 57E to 100.5E

Gemini TV	57E/703 1395RHC
Money TV	57E/703 1348RHC
Sun Movies	57E/703 1348LHC
Sun TV	57E/703 1220RHC
AsiaNet	57E/703 1170RHC
WorldNet	57E/703 1095RHC
NEPC	57E/703 1092/LHC
TVi	57E/703 1015LHC
Azerbaidj.	57E/703 980LHC
Discovery India	68.8/Pas4 Vt/1360
Sony Ent.	68.8/Pas4 Vt/1239
Movie Club	68.8/Pas4 Hz/1117
CNN	68.8/Pas4 Vt/1061
TNT+	68.8/Pas4 Vt/1036
BBC World	68.8/Pas4 Vt/995
MTV & Jain TV	68.8/Pas4 Vt/966
TW6 Mos.	80E/1275
MAPTV	80E/1475
Moscow 1	90E/1475
Moscow 2	90E/1275
India 1	93.5/1025
India 2	93.5/1060
India 3	93.5/1420
CCTV	96.5/1325
Moscow 1	96.5/1475
Value Ch.	100.5/ 1488Vt

Free-to-Air 100.5E to 128E

RTPi	100.5/Vt 1167
TVB Mongolia	100.5Hz 1470
CCTV Henan TV	100.5/Hz 1422
CCTV Guandong	100.5/Hz 1310
CCTV-4 Beijing	100.5/Hz 1183
Moscow 1	103.1/ 1472
Star TV	113/Vt 970
CFI	113/Hz 990
MTV Asia	113/Hz 1030
TPI	113/Hz 1070
TV Indosair	113/Vt 1090
ABN	113/Hz 1120
ANteve	113/Vt 1130
CNNI	113/Vt 1170
SCTV	113/Hz 1190
GMA	113/Hz 1230
TV3	113/Vt 1250
ATVI	113/Hz 1270
TVRI	113/Hz 1310
RTM	113/Vt 1330
RCTI	113/Hz 1350
CNBC	113/Hz 1530
JCSAT3 (test)	128/Vt 1166 & 12290Hz

Free-to-Air 130E to 174W

IBC-13	130E/1265
Laos TV	130E/1375
RAJ-TV	130E/1475
Saudi TV	140E/1425
Moscow 1	140E/1475
Udaya	142E/1225
EMTV	142E/1265
EagleNet	142E/1325
RPN-9	142E/1375
ASN	142E/1475
Moscow 1	145E/1475
NHK	169E/Hz 1115
CNN	169E/Hz 1183
Value Channel	169E/Vt 1400
CCTV-4 (MPEG)	169E/Hz 1426
RFO	180E/1105
WorldNet	180E/1179
CNBC	174W/Hz 990

S19 (?) (Gorizont) 96.5E (RHC)

+/- 3.3 deg (?)

Jain TV	1,275
Muslim TV	1,425
Orbita II	1,475

S21 (Gorizont) 103.2E (RHC)

+/-2.0 deg.

APNA	1,375
Orbita II	1,490

R41 (Gorizont) 130E (LHC)

+/-0.9 deg.

IBC-13	1,265
Laos TV	1,375
RAJ-TV	1,475

AsiaSat 2 100.4E

Sky B-Mac	1130Vt
DW Bouquet (DVB MPEG)	1150Hz 1/DW 2/TV5 3/RTVE 4/MCM 5/RAI
RTPi	1167Vt
CCTV-4	1183Hz
Reuters	1230Hz
STAR Japan (DVB MPEG)	1250Vt 1/"Plus" 2/BBC 3/VIVA 4/CNBC 5/horse racing 6/Sky
CCTV-2	1310Hz
APTV	1351Hz
News-crypt	1390Hz
STAR Asia (MPEG/ CA)	1410Vt 1/"Plus" 2/BBC 3/VIVA
CCTV-1	1430Hz
STAR Asia (MPEG/ CA)	1450Vt A/D'Star B/D'Star C/D'Star
TVB Mongolia	1470Hz
Value Channel	1488Vt

Russian Polarisation

S (Stationar) series satellites are RHC (right hand circular); R (Rimsat) are LHC (left hand circular)

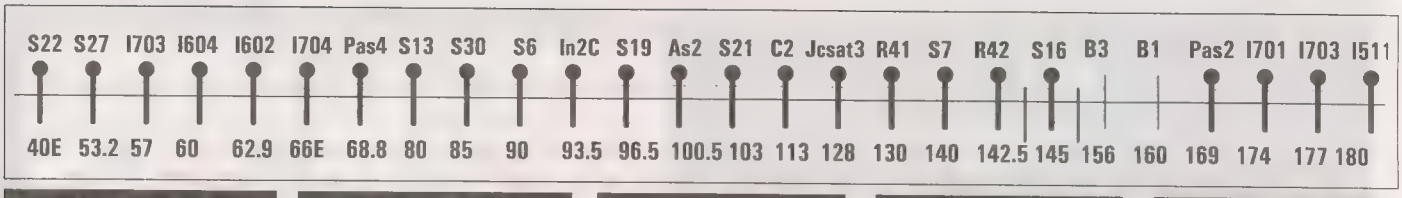
Palapa C2M 113E

Star TV	970Vt
CFI	990Hz
Radio TV Brunei	1010Vt
MTV Asia	1030Hz
ESPN (B-Mac)	1050Vt
TPI	1070Hz
TV Indosair	1090Vt
	1100Hz
ABN	1120Hz
ANteve	1130Vt
HBO (B-Mac)	1150Hz
CNNI	1170Vt
SCTV	1190Hz
	1210Vt
GMA	1230Hz
TV3	1250Vt
ATVI	1270Hz
	1290Vt
TVRI	1310Hz
RTM	1330Vt
RCTI	1350Hz
(data)	1370V -
TNT+ (B-Mac)	1390Hz
(data)	1410Vt
Discovery (B-Mac)	1430Hz
CNBC	1530Hz
Star MPEG tests	1570Hz
(same)	1650Hz

NOTES:

C2M replaced C1 at 113E over period 28 June - 1 July. **Bold** "OK" NZ on 3m.

Russian R,S series satellites are inclined orbit; +/- indicates extent of present inclination .



OPTUS B3 156E (Ku only)

(B-Mac)	1425/Vt
Central ABC HACBSS	1393/Hz B-Mac
Vic. ETV	1361/Vt CryptV.
Imparja TV	1329/Hz B-Mac
(B-Mac)	1297/Vt
Net 9, Sky specials	1233/Vt B-Mac
Central ABC HACBSS	1201/Hz B-Mac
	1169/Vt
Galaxy	1137/Hz Irdeto Mpeg 2
	1105/Vt
Galaxy	1073/Hz Irdeto Mpeg 2
Golden West	1041/Vt
	1009/Hz
	977/Vt

S7 (Gorizont) 140E (RHC)
+/- 4.4 deg.

Saudi TV	1,275
Orbita I	1,475

S16 (Gorizont) 145E (RHC)
+/-3.9 deg..

Moscow 2	1,275
Moscow 1	1,475

OPTUS B1 160E (Ku only)

Net 9, Sky feeds	1425/Vt B-Mac
Data	1402/Hz
QSTV	1377/Hz B-Mac
NE ABC HACBSS	1370/Vt B-Mac
NE SBS HACBSS	1344/Vt B-Mac
SE SBS HACBSS	1339/Hz B-Mac
SE ABC HACBSS	1313/Hz B-Mac
Sky Channel	1296/Vt B-Mac
ABC Radio	1276/Hz (digital)
OmniCast	1270/Vt (FM/FM)
ABC feeds	1247/Hz Pal
Net 7	1244/Vt E-Pal
Net 9 feeds	1219/Vt Pal&Ntsc
	1214/Hz
Net 10	1182/Vt E-Pal
Net 9	1180/Hz E-Pal
Net 10 feeds	1155/Vt Pal
Net 7	1120/Vt E-Pal
Net 9 feeds	1091/Vt Pal
CAA air to ground	1009/Vt Nbfm
CAA air to ground	977/Vt Scpc(fm)

PAS-2 169E (C + Ku)

CCTV3,4	1433.5/Vt (Sa9223)
Abn/Ctn/ Cctv/Nbc	1,426/Hz (Sa9222)
Value Ch.	1400/Vt
Discovery PowerVu	1374/Hz (Sa9223)
MTV Asia	1346/Vt B-Mac
ESPN	1288/Vt B-Mac
MPEG-2 PowerVu Sylmar	1249/Hz (Sa9223)
TNT+ (1/2Tr)	1218/Vt B-Mac
CNN+ (1/2Tr)	1183/Hz
FoxSports	1161/Vt (Sa9222)
NHK	1115/Hz
Filipino Channel	1060/Hz (GI Mpeg)
NBC Mux MPEG	1057Hz (Pace)
MPEG-2 PowerVu HonKong	1002Vt (Sa9223)

PAS-2 Ku

Pas2 test	12,337
PowerVu	12,415V
Karaoke	12,730/H

R42 (Gorizont) 142.5E (LHC)
+/- 0.9 deg.

Udaya	1,225
EMTV	1,265
EagleNet	1,325
RPN9 Sa9223	1,375 PowrVu
ATN	1,465

Intelsat 701 174E

Feeds	963
Feeds	984

Intelsat 703 177E

AFRTS	973 B-Mac *
Feeds	980

* uniquely left hand circular

Intelsat 513 177W

Feeds	963
Feeds	984

(513 Ku)

Service	RF Freq.
US Nets	10980Vt
NBC	11015Vt
Feeds	10510Vt

Ku Services
Intelsat Ku band services shown here are boresighted to Japan and nearby Asia, have not been reported south of equator. At boresight, signals of <2m levels.

TDRS5 / 174.3W

CNBC	990Hz
BBC World	1190Hz MPEG

Intelsat 511 180E(W)
+/- 2.4 deg.

TVNZ	964/Ntl 3000
TVNZ	972/Ntl 3000
TVNZ	980/Ntl 3000
TVNZ	988/Ntl 3000
Aust 9	1,021 *
(data)	1,054
Canal +	1,054 **
(data)	1,092
RFO Tahiti	1,105
(vacant)	1,137
World-net	1,179
CBS/e	1,223
Keystone	1,256
NBC/e	1,277
Mpeg tests	1,310
Mpeg tests	1,325
Mpeg	1,388
Keystone	1,432

* RHC & LHC
** LHC only
e/ encryption

(511 Ku)

Service	RF Freq.
CBS	11480Hz
CNNI	11510Hz

TDRS5 "north" only

UPCOMING SATELLITE LAUNCHES

'Anytime Now' / 2nd Russian Express to 80E.
December/ Thaicom 3 to 78.5E.
January '97/JCSAT-4 to 150E
March '97/ I1801 to 174E.

New satellites: B2P now at 144E (see text); C1 at 150.5E (no reports yet).

WITH THE OBSERVERS

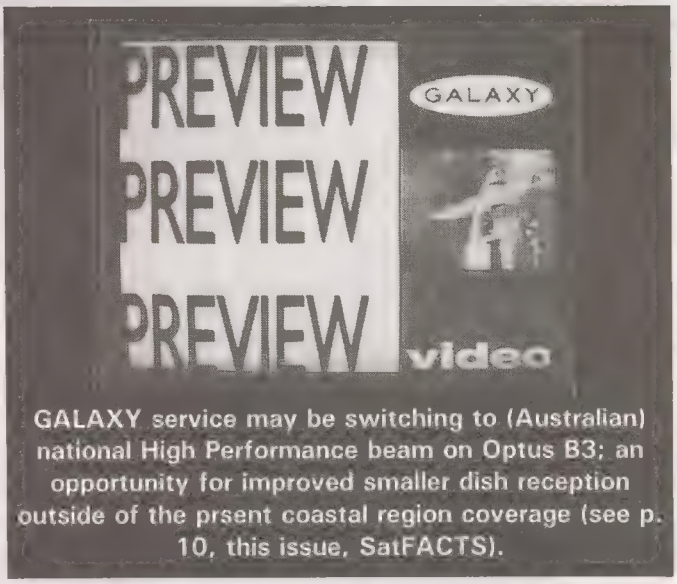
AT PRESS DEADLINE

Mark Long reports from Thailand P3 reception on 2m dish from near China border with following ApStar 1A (134E) services: 970V, 1050V, 1130V, 1290V, 1030H, 1070H, 1110H. All are Chinese services except 1030H which is Arabic/Chinese MTV. These are NOT good levels. Mark also reports more frequent but occasional use of "hot vertical" transponders from Insat 2-C, collocated with 2-B (93.5E).

C-band orbital congestion will grow increasing severe, and cause reception problems for anyone utilising a dish smaller than 3m in size during coming 18 months. The smaller the dish, the broader the beamwidth which simply means it "sees" a larger chunk of the geostationary orbit belt. For many, especially in Australia where signals from various Gorizont, AsiaSat and Palapa satellites are strong enough for 2m (and smaller) dishes to produce usable pictures, there will be some difficult adjustments. In jeopardy are users of satellites in the 80-105E, 120-155E regions in the coming 18 months as new satellites are launched.

Russian satellites, employing circular polarisation, have always been difficult neighbours. While the ITU attempts to "co-ordinate" use of the Clarke Belt, having a Gorizont or Rimsat as an orbital neighbour increases the likelihood your own linear polarised signals will experience interference. The Gorizont (including Rimsat) satellites produce interference that comes and goes at random times because they are moving in an inclined orbit, 'figure-8' pattern. As they cross at the centre of the '8', supposedly dead over the equator, they are in the same 'belt line' as the more stable linear polarised satellites on either side. This is the period of time when interference is at its worst. In a sense, their inclined orbits are a blessing of a sort since they are above (north) or below (south) of the belt for the majority of each day. Japanese users of Star TV Japan feeds from AsiaSat 2 (100.39E) have daily problems when Gorizont S21 (nominally now at 103.1E) wanders into the beam pattern on their typically smaller-than-2m offset dishes. At the same time, users of the Reuters digital data service from AsiaSat 2, located at commercial sites in eastern Australia, are having similar "belt crossing period" problems, causing loss of data channels with their under 3m size dishes.

The recent move of inclined orbit B2P, although still barely +/- 0.7 degrees inclined, to 144.3E points out another problem. B2P arrived on station just before Filipino RPN-9, using Rimsat 142.8E on an IF of 1375 MHz, switched from FTA analogue to digital late in August. The Filipino uplink dish apparently has a transmit pattern that illuminates not only 142.8E but (not surprisingly) 144.3E as well. Several Australian observers report seeing the RPM-9 feed coming back through both 142.8E and 144.3E simultaneously. If you have a dish with adequate selectivity (i.e., the dish beamwidth is narrow enough) you can still find RPN-9 on a spectrum analyser coming back through B2P today! Why the Filipinos ever selected 144E as a permanent location for their Mabuhay 1 satellite (presently due to launch May 1997), knowing that Rimsat was at 142.8 with LHC and Gorizont S16 is operating at 145E in inclined orbit is a mystery.



GALAXY service may be switching to (Australian) national High Performance beam on Optus B3; an opportunity for improved smaller dish reception outside of the prsent coastal region coverage (see p. 10, this issue, SatFACTS).

The Russians may have old, tired satellites at 140.1E (as well as 139.4E) and 145.0E today but are very unlikely to abandon these orbit spots. Sooner or later (and it could be much later) the Russians will either find the money to put high quality satellites at these two spots, or, find some firm such as Rimsat to take the spots over under Russian control.

Further east is no guarantee of freedom from interference, either. Agila 1, the 'other' Filipino firm is planning to use 154E while Palapa C1, the bird that started life in February of this year at 113E before they figured out it was broken, has now drifted under control to 150.5E. There will be a sizeable bunching of new (and not so new) C-band birds in the 140-155E region before satellite operators stop trying to shove birds into locations with shoehorns.

A small dish may produce reasonable quality DTH reception today; it is going to be increasingly difficult to "get by" with anything smaller than 3m over the coming few years at C-band. Consider yourself warned.

Les Brooks in Alice Springs reports that now the musical chairs seems to be over with C2M, he finds all signals in the P4 to P5 range on a 4.5m dish with the exception of Star TV

WITH THE OBSERVERS: Reports of new programmers, changes in established programming sources are encouraged from readers throughout the Pacific and Asian regions. Information shared here is an important tool in our ever expanding satellite TV universe. Photos of yourself, your equipment or off-air photos taken from your TV screen are welcomed. TV screen photos: If PAL or SECAM, set camera to f3.5-f5 at 1/15th second with ASA 100 film; for NTSC, change shutter speed to 1/30th. Use no flash, set camera on tripod or hold steady. Alternately submit any VHS speed, format reception directly to SatFACTS and we will photograph for you. Deadline for October 15th issue: October 4 by mail (use form appearing page 30), or 5PM NZT October 5th if by fax to 64-9-406-1083.

MPEG-2 TUNING PARAMETERS (15 September 1996)

Bird	Service	RF/IF & Polarity	# Programme Channels	FEC	(k)(M)s/s	Interoperable Receivers (1)
As2	EBB	4000/1150 Hz	5TV, 9 radio **(a)**	3/4	28.13	NTL, DGT400(**2**), DVR500, IRD520
	Star +	3900/1250 Vt	7TV, 1 radio **(b)**	1/2	28.1	NTL
	APTV (news)	3799/1351 Hz	1TV, 1 aux.	3/4	5.63	NTL, Comstream
R42/142.5E	RPN-9	1,375 LHC	1TV, 1 radio	unknown	unknown	S-A PowerVu
PAS-2	TCS Sing.	4183/967 Hz	2TV	1/2	6.62	S-A PowerVu
	S-A HK Pv	4148/1002 Vt	6TV **(c)**	2/3	24.43	S-A PowerVu
	Discovery Singapore	3776/1374 Hz	1TV, possibly more	3/4	19.85	S-A PowerVu
	NBC HK Philips	4093/1057 Hz	7TV **(d)**	3/4	29.47	NTL, DGT400(**2**), DVR500, IRD520
	SA-California PowerVu	3901/1249 Hz	7TV **(e)**	3/4	30. 800	S-A PowerVu
	SA-California PowerVu	12415/1115 Vt	7TV **(e)**	3/4	30. 800	S-A PowerVu
	CCTV China PowerVu	3716.5/1433.5 Vt	2TV **(f)**	3/4	19.85	S-A PowerVu

1) Interoperable receivers: Receivers which have proven through repeated use to be capable of reliable digital reception for the programme service listed. **2)** Pace (Galaxy) DGT400 units will only work on these services if they have not been over-the-air "upgraded" to include 'Programme Censorship' classification system. **(a)** through **(e)**: See SatFACTS August 15, 1996 for listing of individual programme service channels; p. 29. Bottom listing for Ku-band California PowerVu; repeats California C-band channels. (f) CCTV3 pgm ch. 2, CCTV4 pgm ch. 1. Discovery uses pgm ch. '50' (not a typo).

which has lost ground to a P2 level. Les also reports the only C-band signal still operating from Intelsat at 66E is CFI; WorldNet and Muslim TV have gone elsewhere.

On a northern beam only: BBC World in MPEG-2 (1190 IF, Hz) and CNBC in NTSC analogue (990 IF, Hz) from TDRS-5 at 174.33W (not 'E'). Anyone south of the equator seeing either of these?

David Leach (NSW) reports Saudi TV is now operating on an IF of 1275 from Gorizont S7 (140E). This one may be difficult to catch given the +/- 4.5 degree inclined orbit of this tired, old bird.

The sudden drop in Russian Orbita service power level from 96.5E may have a simple explanation. The latest NASA data shows Gorizont 19 (the original bird) at 96.67E and newer Gorizont 27 at 96.04E. Perhaps the explanation is as simple as turning off 19 and turning on 27. **Garry Cratt** (NSW) reports "*This bird now has very little inclination.*" For a Gorizont to suddenly lose its regular figure 8 oscillation rate has no explanation; other, of course, than the bird being replaced by another one with less inclination. Now, if 27 is really the operational bird from 96(.X)E, one must ponder whether 19 is being moved to another location; perhaps 140E?

Several Australian reporters advise Palapa's **RCTI** has been switching to B-MAC for protected programming feeds and the encrypted programming can be accessed by using a Drake receiver ahead of a CDE-2000 Indovision decoder by pushing the Drake's "external decoder" button.

Mongolian TV on AsiaSat 2 programs Tuesday through Sunday; Monday the Voice of America uses this transponder (IF1470, Hz).

AsiaSat 3, to head for 122E with 24-C and 16-Ku transponders, will be lifted by Russian Proton launcher during third quarter (July-September) 1997. Hughes is building the next generation As bird at their Los Angeles facility.

Bruce Barnett (Wanaka, NZ) follows up his detailed report on reception challenges in South Island from Galaxy through B3 (see Coop's Technology Digest August 23; p. 16) with this update. Using 3.7m KTI (mesh) dish equipped with Ku feed, Barnett had been troubled by signal dropouts which seemed to occur with considerable repetition at about the same time each day. Numerous attempts to optimise the feed, LNB, and the dish (including stringing the dish for precision alignment to the parabolic shape) seemed to make little difference. *He has now located the problem.* By pushing gently up on the dish rim from the ground side the signal quickly stabilised. Readjusting the elevation to produce the same 2mm "lift" did not produce the same result indicating the dish was dead-on but mysteriously would work when the lower lip was gently nudged upward from below. The problem? **Dish sag**, a seemingly unimportant 2mm which at Ku was enough to cost him 2dB in signal level. By running "lacing wire" from top of dish to bottom, and using small turnbuckles to precisely lift the lower lip he compensated for the sag. Others can benefit from his findings: A mesh dish, designed primarily for C-band use, when pressed into service at Ku may indeed hold its shape to a stringing check but in fact the effects of gravity pulling the weight of the dish downward can cause very small but important errors in the dish shape. At Ku these errors are not insignificant and when you are after the last dB with a weak signal such as Galaxy on B3 in NZ, you need to optimise the dish to the extent that even natural "dish sag" is eliminated. The actual gain of the KTI 3.7m at Ku is not known making it impossible to reference gain to a known Ku rated antenna.

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OBSERVER REPORTING FORM - Due OCTOBER 4, 1996

• **New programming** sources seen since September 1st:

_____

_____

• **Changes** (signal level, transponder, programming content) in pre-existing programming sources since September 1st:

_____

_____

• **Other** (including changes in your receiving system): _____

_____

Note: Please use P1-5 code when describing reception quality and receiver IF or RF settings.

Your name _____
Town/City _____
Make/Size dish _____ LNB _____ Receiver _____

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How should receivers deal with differing Msym, FEC and SI (system information) data streams within the DVB Compliant format? _____

_____

Should even low-priced receivers include BER (bit error rate) diagnostic information?

_____

What should the low-priced units sell for in US$ at the consumer level during 1997?

_____

Should manufacturers be encouraged to create one single DVB Compliant format?

_____

Additional suggestions _____

Your Name _____ Town/City/Country _____

Return to: SatFACTS DVB, P.O. Box 330, Mangonui, Far North, New Zealand (or via fax 64-9-406-1083) by 15 October.

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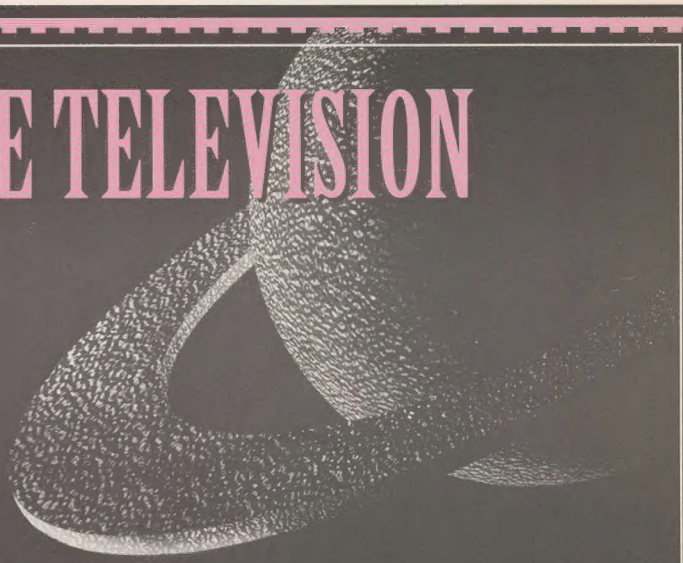

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